CERTAIN NOMENCLATURAL PROPOSALS IN GALAXIIDAE: A REJOINDER

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SUMMARY

In a recent paper (Stokell, 1966) the hitherto universally accepted trivial name *truttaceus* is discarded and replaced by *scopus; Galaxias attenuatus* (Jenyns) and *G. alpinus* (Jenyns) are relegated to the synonymy of *G. maculatus* (Jenyns); a new subspecific name, *ignotus*, is proposed for the Tasmanian and mainland Australian subspecies of the fish hitherto known as *G. attenuatus;* the specific distinctness of *G. auratus* Johnston and *G. weedoni* Johnston is called in question. The present paper sets out a case against these nomenclatural innovations.

0. INTRODUCTION

0.0. The proposals. — In a recent paper, *A Preliminary Investigation of the Systematics of Some Tasmanian Galaxiidae* (Stokell, 1966) certain proposals involving nomenclatural change are made: *(a)* the trivial name, *truttaceus*, of the fish that has hitherto been recognised as the genotype of *Galaxias* Cuvier, 1816 is rejected, the species now being called *G. scopus* Scott, 1936 [date cited, in error, as 1935]; *(b) Galaxias attenuatus* (Jenyns, 1842) and *G. alpinus* (Jenyns, 1842) are stated to be synonymic with *G. maculatus* (Jenyns, 1842), by which last name (which enjoys page priority) all three thus now become known; *(c)* a Tasmanian (and mainland Australian) subspecies of the species known up till now as *G. attenuatus* is described under the new name of *G. maculatus ignotus* Stokell, 1966; *(d)* Of *G. auratus* Johnston, 1883 and *G. weedoni* Johnston, 1883 it is observed 'it seems questionable if these two nominal species are distinct.'

0.1. Rejoinder. — The present paper advances the following views: *(a)* the name *Galaxias truttaceus* (Cuvier, 1816) should be retained; *(b)* the suggested identity of Jenyns' three species stands unproven, and, on the information at present available, they should continue to be treated as distinct; *(c)* the Tasmanian and mainland subspecies of the species hitherto known as *G. attenuatus*, if valid, should be known as *G. attenuatus scriba* Cuvier & Valenciennes, 1846; *(d)* Johnston's two species are quite distinct.

0.11. While the interest attached to two of these nomenclatural proposals — *(c)*, *(d)* — is in large measure restricted to taxonomists more or less directly engaged with the systematics of the family and to students of the local fauna, the case is far otherwise with *(a)* and *(b)*. Both the first of these, involving as it does the introduction, after a century and a half, of a new trivial name for the species hitherto accepted as the genotype of *Galaxias* Cuvier, 1816, the foundation genus of Galaxiidae, and the second, necessitating the use of a name other than that till now employed for the one widely distributed Galaxiid, clearly have potential repercussions extending far beyond the field of the Tasmanian fauna, any general discussion of the Galaxiidae—purely systematic, zoogeographical, ecological, or otherwise — almost inevitably entailing some reference by name to one or both of these species.

I. PROPOSED DISCARDING OF THE TRIVIAL NAME *truttaceus* and ITS REPLACEMENT BY *scopus*

1.0. The proposal. — 'The application of the name *truttaceus* to the Tasmanian fish appears to be a misidentification of a type species and a new name or the reinstatement of a synonym to be necessary' (p. 79). The name adopted is *G. scopus* Scott [in a table of synonymy heading a description of material from the 'lower Tamar River and its tributaries' the date cited, 1935, is that of the session of the Royal Society in which the relevant paper was submitted: date of publication is 1936].

1.1. The argument. — The discussion of the status of the trivial name *truttaceus* occurs on pp. 78-79.

1.11. Apart from the opening sentence ('The name *truttaceus*, which is universally applied to the common black-spotted [the epithet black-spotted is applicable — and then not very appropriately, the markings being ocelli — only to preserved specimens] species of Tasmania and Victoria, is of very doubtful validity'), the material is of an introductory nature, and is confined to facts well known. The definition by Cuvier of *Galaxias* [1817 cited : it is generally accepted the actual date of publication is 1816] is quoted, together with the original footnote ('(i) *Esox truttaceus* Cuv. espèce nouvelle, ou peut-être L'es. *argenteus* Forst?') and the footnote of later editions ('*Esox truttaceus* Cuv. *Esox alepidotus* Forst'); G. Forster's notice (1777) of the taking by Captain Cook in 1773 at Dusky Bay, New Zealand of the first known Galaxiid is recalled; Gmelin's (1789) latinized description based on Forster's account (but using, on the assumption of identity of the two forms, the name, *Esox argenteus*, proposed by G. Forster for a fish taken from the sea at Tanna Island) is quoted.

1.111. It is convenient at this point to observe that the combination *Galax (ias) truttaceus* appears for the first time in the German edition of Cuvier (1822 : 309), a translation and enlargement of the first edition, in which Cuvier's names are now latinized (Scott, 1936 : 89).

1.12. The first paragraph and the first two sentences of the second paragraph on p. 79 are critical and need to be quoted in full.

1.121. 'In 1801 Bloch and Schneider published J. R. Forster's account of the fishes taken on Captain Cook's voyages, and recorded the yellow-spotted [the markings are perhaps blotches and vermiculations, rather than spots] species from Dusky Bay as *Esox alepidotus*, which was J. R. Forster's manuscript name. These descriptions were published many years before Cuvier defined his genus, and no description of the Tasmanian fish appears to have been published in the interim. The yellow or golden markings recorded on the New Zealand fish constitute the principal evidence of the species on which the genus was founded. Their resemblance to a galaxy suggests the reason for the name *Galaxias*, which cannot be conceived to have been inspired by a contemplation of the black-spotted fish in [in = of ?] Tasmania. Cuvier & Valenciennes (1846), actually Valenciennes who wrote of Cuvier in the third person, asserted that the genus was based on the Tasmanian fish and applied the name *truttaecus* to this species, but made no attempt to explain the name *Galaxias* or Cuvier's alleged ignorance of the New Zealand fish until the Tasmanian one was obtained.'

1.122. 'The application of the name *truttaecus* to the Tasmanian fish appeared to be a misidentification of a type species, and a new name or the reinstatement of a synonym to be necessary.' The species hitherto known as *G. truttaceus* is then formally called *G. scopus* Scott, and an account of ten Tasmanian specimens follows.

1.2. Rejoinder. — It is here contended that the name of the fish (found in Tasmania, on the Australian mainland, and on at least some of the islands of Bass Strait) hitherto spoken of as *G. truttaceus* is that name.

1.21. The sections of Stokell's paper quoted in 1.121, 1.122 above may now be discussed. In Cuvier & Valenciennes' *Histoire naturelle des Poissons* (viii, Paris 1846 — August or September : written by Valenciennes, who speaks of Cuvier in the third person) the circumstances surrounding the establishment of the genus *Galaxias* and the naming of the type species are reported as follows (it seems expedient to give a tolerably free translation : the precise meaning at any point can be checked from the original, here quoted in square brackets).

1.211. The genus Galaxie is one of Cuvier's own formulations; he established it on a small fish, brought back from New Holland by Péron & Lesueur, and which has since been found there again by Quoy & Gaimard. These two royal navy surgeons brought it to our notice that Péron's fish lived in the fresh waters of Van Diemen's Land. ['Le genre Galaxie est une création de M. Cuvier; il l'a établi sur un petit poisson, rapporté de la Nouvelle-Hollande par MM. Péron et Lesueur, et qui y été ensuite retrouvé par MM. Quoy et Gaimard. Ces deux chirugiens de la marine royale nous apprirent que le poisson de Péron vivait dans les eaux douces de la terre de Van-Diemen': p. 340].

1.212. A species of this genus was discovered and thoroughly described by Forster at the time when Captain Cook, during his great circumnavigation, landed, in 1773, on New Zealand. His description, published by Bloch, was recognised only when Cuvier came to determine the fish brought back by Péron. Our noted zoologist named it *Esox truttaceus*, adding that it was perhaps Forster's *Esox argenteus*. He was more definite in the second edition of the *Règne Animal* in distinguishing within the genus Galaxie his *Esox truttaceus* from Forster's *Esox alepidotus*. ['Une espèce de ce genre a été découverte et parfaitment décrite par Forster à l'époque où le capitaine Cook, dans sa grande circumnavigation, abordà, en 1773, à la Nouvelle-Zélande. Sa description, publiée par Bloch, ne fut reconnue qu'à l'époque où M. Cuvier détermina le poisson rapporté par Péron. Notre grand zoologist le nomma *Esox truttaceus*, en ajoutant que c'était peut-être l'*Esox argenteus* de Forster. Il a été plus positif dans la seconde édition du Règne animal, en distinguant dans le genre Galaxie son *Esox truttaceus* de l'*Esox alepidotus* de Forster': pp. 341-2]. (The two footnotes are quoted above in 1.11).

1.213. Valenciennes' account of the Tasmanian species, headed The spotted Galaxie (*Galaxias truttaceus* Cuvier) [*La* Galaxie truitée (*Galaxias truttaceus*, Cuv.], is as follows. If we cannot say that *Galaxias truttaccus* is the first known species of this genus, since Forster had previously observed one of those (species) that stock the fresh waters of New Zealand, we must take it the spotted Galaxie was the first species referred in a definitive fashion to this genus; for it [*i.e.*, the genus] was established on it. Since Péron, Quoy & Gaimard have again found it in Van Diemen's Land. [Si l'on ne peut dire que le *Galaxias truttaceus* soit la première espèce connue de ce genre, puisque déjà Forster avait observé l'une de celles qui peuplent les eaux douces de la Nouvelle-Zélande, on doit regarder que la Galaxie truitée a été la première espèce rapportée d'une manière positive a ce genre; car il été établi d'après elle. Depuis Péron, MM. Quoy et Gaimard l'ont retrouvée à la terre de Van-Diemen': p. 344].

1.214. These three extracts would thus seem to set forth, quite clearly, a simple and unambiguous situation. Cuvier established *Galaxias* on a fish brought from Tasmania by Péron and Lesueur, giving it the trivial name *truttaceus* (= spotted). It was only when he came to determine Péron's fish that the status of Forster's New Zealand fish, of which Bloch had earlier published an account, was recognised; and in the first edition of his book he suggested his fish might perhaps be the same as Forster's, but in the second he listed them as two species. Valenciennes expresses the view that Cuvier's Tasmanian fish is the effective genotype.

1.22. On the passages on p. 79 in Stokell quoted in 1.121, 1.122 the following additional observations may be made.

1.2211. That Valenciennes offers no explanation of the name *Galaxias* is true : indeed, to the best of the present writer's knowledge, there is no authoritative contemporary or early (*i.e.*, up to, say, Valenciennes' time) published explanation. *La galaxie* is certainly the French term for the galaxy or Milky Way : but its connotation here is wholly conjectural. There is indeed no certainty even that it has reference to the markings of the fish — it

may conceivably relate, as has been suggested, to the milky-white color Galaxiids often assume on preservation; it may conceivably have been suggested (as far as Cuvier is concerned by explorers' accounts) by the number and disposition of fish migrating in a ribbon up a river; it may even have no visual connotation at all. However, with Valenciennes chided, it would seem (the tendentious tone of the sentence being set by the gratuitous 'alleged' preceding 'ignorance') for having 'made no attempt to explain the name *Galaxias*,' a New Zealand ichthyologist, writing well over a century later, has been able to establish, to his own satisfaction, first, that 'the yellow or golden markings recorded on the New Zealand fish constitute the principal evidence of the species on which the genus was founded,' and secondly, 'their resemblance to a galaxy suggests the reason for the name *Galaxias*, which cannot be conceived to have been inspired by a contemplation of the black-spotted fish in Tasmania.'

1.22111. On the question of body markings and a generic name possibly suggested by them it may be remarked in passing : *(a)* the New Zealand fish was described by Gmelin (1789 : 1393) as having markings in the form of yellowish letters ('litteris flavicantibus'), Stokell's own version (p. 78) being 'yellowish spots in the shape of some ancient Asiatic characters'; *(b)* 'black-spotted' is not a satisfactory descriptive term for the markings of the Tasmanian fish, the great majority of which take the form of a dark centre (in life commonly greenish or brownish, with or without a purplish cast) surrounded by a light annulus (this distinctive ocellation is indicated clearly in, *e.g.*, the figure by Regan (1906, pl. xiii, fig. 4)), the live fish, incidentally, often sparkling with flashing gold points; *(c)* the relation between observable markings and the name of a a taxon inspired by them is in any case largely a semantic problem, any judgement on which, in such a set-up as the present, is obviously of a highly subjective nature.

1.2212. Just in what way the circumstances that Valenciennes failed to provide the derivation of the generic name *Galaxias* and/or to explain Cuvier's 'alleged ignorance' of the nature of Forster's New Zealand species till he came to describe his own fish can be interpreted as invalidating Valenciennes' definite statements quoted above (2.11) that Cuvier founded his genus on a fish from Tasmania to which he gave the trivial name *truttaccus*, and that Cuvier's species, rather than Forster's earlier described species, should be regarded as the first species referred definitively to this genus, it is indeed not easy to see.

1.2221. It will have been observed that the argument in Stokell's paper has up to now been concerned with the generic name *Galaxias* and its possible origin. The trivial name *truttaccus* itself (which it is proposed should be rejected) has been the subject of no discussion. In this rejoinder the circumstances of its formal introduction have been set out above in the extracts from Valenciennes : the suitability of the application to the 'black-spotted' Tasmanian fish of *truttaccus*, the latinized form of the *truitée* of the French vernacular (La Galaxie truitée : Valenciennes, p. 344) seems evident, and has not been called in question [truité (fem. truitée): 'red-spotted; speckled; spotted (dog, etc); flea-bitten, trout-coloured (horse); mottled (pig-iron); crackled (china)': Harrap (1953 : 865)]. With the first sentence of the second paragraph on p. 79 — 'The application of the name *truttaceus* to the Tasmanian fish appears to be a misidentification of a type species, and a new name or the reinstatement of a synonym to be necessary' — the train of reasoning, however, abruptly takes a fresh turn.

1.2222. The entities significantly involved in the situation are these. Set I. — *A*, a species of spotted fish found in Tasmania; *a*, its trivial name, *truttaceus*; *α*, specimens attributed to this species: Set II. — *B*, a species of fish from New Zealand with yellowish markings; *b*. its trivial name, *alcpidotus* (or *argenteus*); *β*, specimens attributed to this species: Set III. — *Z*, a fish genus; *z*, its name, *Galaxias*; *ω*, species attributed to this genus ['species', 'genus' here being taken to be defined by their relevant diagnoses]. Sets I and II are commensurable; while their components are formally paralleled by those of Set III. From the passage quoted in 1.121 it would naturally be concluded that the domain of the argument was restricted to Set III, and hence that, since the name *Galaxias* is there claimed to have been inspired by the markings on Forster's species, the New Zealand species would be nominated as genotype, the matter ending there. However, what is now called in question (and, later, categorically rejected) is the validity of the relation between two components of Set I, namely, between *A*, the spotted Tasmanian species, and *a*, its trivial name. Regarding this suggested invalidity of the hitherto universally accepted relation between *A* and *a* no evidence is presented and no discussion is entered into.

1.2223. The rest of the second paragraph on p. 79 is concerned with the choice of a synonym to replace *G. truttaccus*, the name adopted being *G. scopus* Scott, 1936. A description, under this heading, of ten specimens then follows.

1.3. It is not proposed to enter here on a discussion of the true status of the fish from Clarke Island, Bass Strait, for which the name *G. scopus* was originally proposed — this being of course a problem quite other than that of the rejection by Stokell, on the grounds stated and examined above, of Cuvier's name *truttaccus* and its replacement by *scopus*. The name *scopus* may *(a)* be used to denote a species, *Galaxias scopus*, satisfactorily known only from the type material — as originally proposed; or *(b)* be employed as a subspecific name in the trinomial *Galaxias truttaccus scopus* — as by Munro (1957 : 34); or *(c)* be rejected, as a synonym of *Galaxias truttaccus* — as by Frankenberg (1966, pl. on p. 161). The present writer considers it expedient to postpone the expression of a definitive opinion on the matter pending the examination of further topotypical material and its comparison with material from various localities on the Tasmanian mainland and the mainland of Australia. In any event, the word *scopus* should not be used as a substitute for *truttaceus*.

1.4. Type locality. — The adoption of Stokell's proposal would make Clarke Island [rendered Clark by Stokell], near the north-eastern tip of Tasmania — for notes on locality see Scott (1936 : 97) — the type locality for the species hitherto known as *G. truttaceus*. Material from Clarke Island ap-

pears not to have been seen by Stokell, who, however, mentions (p. 79) a specimen from adjacent Flinders Island. The ten examples on which his description is based are from 'the lower Tamar River and its tributaries'; additional localities recorded for the species being Flinders Island and Victoria. [No reference is made at any point to *G. truttaccus hesperius* Whitley, 1944; type locality, Creek flowing into Taylor's Inlet (Nannarup), Albany District, Western Australia]. The inclusion, in error, in the Australian Check-List (McCulloch, 1929 : 48) of New Zealand among the localities from which *G. truttaccus* (Cuvier) has been recorded led the present writer (1936 : 89) to review (largely on bibliographical data obligingly supplied by Mr G. P. Whitley, then Ichthyologist, Australian Museum) some of the early references (including some quoted in the present paper) to this species. A passage (p. 90) designating a type locality for Cuvier's species may fittingly be quoted here. 'Dealing with an excursion made [during the visit of Baudin's expedition to the D'Entrecasteaux Channel district, 13th January - 13th February 1802] by a party in the neighbourhood of the "Rivière Fleurieu" inland from "le port des Cygnes," Péron (1807, p. 234) remarks, ". . . ils y avaient aussi vu de nombreuses truites; et M. Lesueur m'en rapportoit quelques-unes qu'il avoit tuées d'un coup de fusil." It seems very probable that these "truites" were *Galaxias truttaccus*, and, on the evidence available, I venture to redesignate the type-locality of this species as Agnes River (Rivière Fleurieu of Péron), South Eastern Tasmania.'

2. PROPOSED RELEGATION OF *G. attenuatus* AND *G. alpinus* TO SYNONYMY OF *G. maculatus*

2.0 The proposal. — On Darwin's Beagle material Jenyns (1842) founded his *Mesites*, with three species, *M. maculatus*, *M. alpinus*, *M. attenuatus*, the first two from South America, the third from New Zealand. The incorporation by Cuvier & Valenciennes (1846) of *Mesites* in *Galaxias* (Jenyns appears to have been unacquainted with Cuvier's genus — a circumstance that is, perhaps, not without a moral in connexion withc Cuvier's 'alleged ignorance' of Forster's New Zealand fish) has usually been accepted; though some writers (*e.g.*, Whitley, 1933 : 61; 1960 : 28) follow Ogilby (1899 : 158) in referring one or more of Jenyns' species to *Austrocobitis* Ogilby (substitute for *Mesites* Jenyns, preoccupied). [For history of *Austrocobitis* see Scott (1966)].* Stokell states 'the three species cannot be regarded as distinct' (p. 77); all thus coming to be known as *G. maculatus* (Jenyns), which name has page priority.

2.1. The argument. — Direct consideration of Jenyns' three species is found in the first paragraph of p. 77 (quoted below, 2.12). the rest of this section of the paper (pp. 76-78) being devoted to a discussion of the three subspecies there recognized (for status of the proposed Tasmanian and mainland Australian subspecies, see section 3, below).

2.11. However, one point on p. 76 calls for attention here. The statement, 'The fish known as *Galaxias attenuatus* in Tasmania differs materially from the form bearing this name in New Zealand' introduces a review of certain meristic characters, the penultimate sentence of which begins 'Three specimens from Chile, where the fish is known as *G. maculatus* . . .' These three Chilean specimens are then regarded as belonging to the South American subspecies of a species having also New Zealand and Tasmanian (and mainland Australian) subspecies : and the whole question of the trivial name seems thus to be begged.

2.12. For convenience of discussion (2.21) each of the sentences of the first paragraph on p. 77 here quoted is prefixed by a reference letter in square brackets '[*a*] All Jenyns' descriptions were based on juvenile examples from about two inches to about two and a half inches in total length. [*b*] In view of the differential growth prevalent in these fishes during the transition from the juvenile stage to the adult stage the proportional measurements have little definitive value. [*c*] Colouration, to which much importance was attached, also shows a considerable change at this stage. [*d*] When the New Zealand fish come in from the sea they are unpigmented except for the eyes and vertebral column, the normal colour pattern commencing to develop after a short residence in fresh water. [*e*] The most important character recorded in the original descriptions is the number of anal fin rays which is given as 15-16 in *maculatus*, 16 in *alpinus* and 17 in *attenuatus*. [*f*] These figures are not sufficiently different for specific separation, and the three forms as described cannot be regarded as distinct.'

2.2. Rejoinder. — It is here contended the proposed lumping of Jenyns' three species stands unproven. It is possible, indeed, a thorough investigation might establish identity among all or some pair of these forms : however, the case presented in the paper under review is too limited in scope of characters considered, is based on too little material (no examples at all of *G. alpinus* appear to have been examined), and is of far too conjectural a nature to justify the immediate nomenclatural changes made.

2.21. Some observations on the passage quoted in 2.11 follow.

2.211. [*a*]. It is true that Jenyns' types were small fish (approximate lengths in mm : *G. maculatus* 55-58, *G. alpinus* 56-62, *G. attenuatus* 63). However, Regan (1906) accepted Jenyns' three species as valid, having before him examples of *G. maculatus* up to 120 mm, and of *G. attenuatus* up to 135 mm (with South American individuals up to 110 mm); though in the case of *G. alpinus* he had access only to the types.

2.2121. [*b*]. The implied problem of distinguishing, on metrical characters, between fish of different species of the size of Jenyns' material does not, in

* In an early paper (1936) the writer made brief reference to fin posture among Galaxiids. Several years ago when identifying species of Galaxias in the local whitebait he was struck afresh with the difference in the insertion and the set of the pectoral in G. attenuatus as compared with the other Tasmanian species, and incorporated these features in working keys to the fry. This feature also attracted the notice of, and has been found of use in the identification of juveniles in New Zealand whitebait by, McDowall (1964 : 140), who gives an excellent description of fin's form and position. Whether this type of pectoral is confined to G. attenuatus (or to a small group of species — among which G. maculatus, if genuinely distinct, and/or G. gracillimus (Canestrini, 1864) at once suggest themselves), and whether, if this be the case, it may render advisable the use of Ogilby's name Austrocobitis for this species or these species are points worthy of investigation and consideration.

the writer's experience, exist. Without knowledge of a species' life history, indeed, an observer may find difficulty in associating a juvenile with an adult, though even this situation would, in general, be likely to be really awkward with fish at a very early stage. Young *G. attenuatus* on the vernal inland migration have on arrival, about October, near Launceston, Tasmania, in Punchbowl Creek, which connects with the North Esk upwards of forty miles from the sea, a total length of about 45 mm, and attain a size comparable with Jenyns' larger individuals only towards or at the end of their first summer: however, even on arrival in the Creek these fish are specifically determinable almost at a glance. [For a study of these immigrant fish, see Scott (1938)].

2.2122. Woods (1963 : 29) has defined whitebait [in the New Zealand connotation of the term; which has at least half a dozen meanings in as many countries] as 'The transparent, free-swimming and shoaling juveniles of at least five species of galaxias.' His outline figures depict clearly distinguishable forms (as reproduced, they range from 35 to 52 mm in total length : no scale is noted, but the illustrations may well be life size). McDowall (1964), who discusses proportions, meristic characters, pigmentation, and provides good figures, concludes 'The "whitebait" of the fisherman is thus presumably *G. attenuatus*, with *G. fasciatus*, *G. postvectis*, *G. brevipinnis* and probably *G. argenteus* making up a small proportion of the catch' (p. 145) : *G. campbelli* may also be involved (Woods). In Tasmania the whitebait fishery was formerly based almost wholly on a small endemic Aplochitonid, *Lovettia sealii* (Johnston, 1883), the biology of which has been thoroughly studied by Blackburn (1950). In recent years, however, Galaxiids, previously of quite minor importance, have become the main constituents of the whitebait runs, the species encountered in northern rivers (Lynch, 1965 : determinations by present writer) being *G. attenuatus*, *G. truttaceus*, *G. weedoni*, with a modal standard length of 40-50 mm. So well marked are specific differences, even in samples taken but a short distance inland (quite shortly after, at times before, the onset of pigmentation) that a leaflet, drawn up by the present writer at the request of the Inland Fisheries Commission and distributed by that body to anglers makes possible species determination by any careful observer.

2.21221. In assessing the importance attachable to the above observations, from 2.121 onward, on the relative ease with which it has in practice been found possible to sort out fry into species, it should be borne in mind that the New Zealand and Tasmania species mentioned are probably, at least in general, more trenchantly separable from one another than are Jenyns' trio of species.

2.2123. Differential growth occurs, in a number of morphological features, throughout most, or the whole, of life in many, if not all, Galaxiids—for a study of differential growth in *G. attenuatus* see Scott (1938). However, the resultant changes in proportion follow, as far as the matter has been investigated, a regular species pattern, so that, as already indicated, even quite juvenile examples of different species present well marked differences in metrical (and meristic) characters from one another. It may be remarked that if this were not so, the circumstance would negate the very conclusion Stokell has based on the small size of Jenyns' specimens. If the fish were too small to exhibit characters adequate for their taxonomic separation, equally they would be too small to exhibit characters adequate for the taxonomic act, equally positive, of declaring them conspecific.

2.213. [*c*], [*d*]. The observation in [*d*] has no direct bearing on the present situation, Jenyns' fish being past the onset of pigmentation. Coloration, as observed in [*c*], undergoes change, usually very considerable, during the postlarval and juvenile stages—for example, an early barred phase in *G. truttaceus*, the adult of which is ocellated, has been reported (Scott, 1941). Nevertheless, specific histories are followed through; differential patterns of coloration in the species of *Galaxias* occurring in Tasmanian whitebait being evident from the earliest appearance of pigmentation.

2.214. [*e*]. Apart from the mention of the fact that radiographs of the types in the British Museum give for *G. attenuatus* 64 vertebrae, and for *G. maculatus* 64, 61, 63 (type, two cotypes)—all of which values Stokell suggests should be reduced by one, as he considers they probably included the urostyle, which is not included in his own counts (such amended values would tell, if anything, against the suggested conspecificity of *G. maculatus* and *G. attenuatus*, bringing the minimum for the former one below the lowest value ever recorded for New Zealand specimens of the latter)—the similarity, in one instance the overlapping, of the number of anal rays as recorded by Jenyns for his three species is the only direct evidence advanced in favour of their conspecificity.

2.215. [*f*]. In the general account of his *Mesites* Jenyns observes (p. 119), 'Mr Darwin's collection contains no less than three species of this new genus, differing but slightly from each other'. On commenting on his specific diagnoses, however, he says (p. 121) of his *M. alpinus* 'I have no hesitation in considering it distinct from the last' [*i.e.*, *M. maculatus*], and (p. 122) of his *M. attenuatus* 'This, which is a very distinct species of the new genus'. It may be noted in passing that *M. alpinus* was taken in Hardy Peninsula, Tierra del Fuego in 'alpine fresh-water lakes', a possible, but not very likely, habitat of *G. attenuatus*. Differences that permit the keying of the three forms were observed by Regan. Restriction of the comparison between them to the one or two features selected by Stokell fails to make adequate use of available data, and surely does not provide satisfactory grounds for asserting the three named forms are conspecific.

3. STATUS OF PROPOSED TASMANIAN (AND MAINLAND AUSTRALIAN) SUBSPECIES OF *G. attenuatus* AND VALIDITY OF ITS PROPOSED SUBSPECIFIC NAME *iguotus*

3.0. The proposals.—*(a)* A Tasmanian (and mainland Australian) subspecies of the species hitherto known as *Galaxias attenuatus* is described (p. 78). *(b)* Synonymisation of *G. attenuatus* with *G. maculatus* followed by the recognition of three subspecies automatically leads to the names of the South American and New Zealand forms being *G. maculatus maculatus* and *G. maculatus attenuatus*,

respectively : for the proposed Tasmanian and mainland Australian subspecies established the subspecific name *ignotus* is published.

3.1. The argument.— *(a)* The three subspecies are founded solely on three meristic characters, frequency distributions being given for number of vertebrae and number of branched anal rays and ranges being noted for number of branched dorsal rays. *(b)* The section dealing with the name of the subspecies for which a full description is provided is here quoted.

3.111. 'Many nominal species have been proposed from Australia, some of which have been regarded as synonyms of *attenuatus*, but even if they could be identified from the scanty data furnished most of them would not be available now. *G. krefftii* Günther (1866) has never been recognised and is now a *nomen oblitum*. *G. punctatus* Günther (1886), *G. waterhousii* Krefft (1867), *G. cylindricus* Castelnau (1872), *G. delicatulus* Castelnau (1872), *G. nebulosus* Macleay (1881) and *G. obtusus* Klunzinger (1872) appear to be in the same category. They were not included as valid species in the list of Regan (1905) and McCulloch (1929), in consequence of which they are judged to be lapsed names. *G. versicolor* Castelnau (1872) was included in both Regan's and McCulloch's lists and would still be available. It is described as having a total of 12 rays in the anal fin which disqualifies it as a species to which the Australian form known as *attenuatus* could be referred.

3.112. '*G. amaenus* Castelnau (1872) which also has been kept alive by inclusion in Regan's and McCulloch's lists is described as having a head in total length of 4⅓. This indicates a much longer head than ever occurs in the fish known as *attenuatus* in Australia. These fish are very poorly described, and the account of *versicolor*, at least, is based on a single specimen. *G. scriba* Cuvier and Valenciennes (1846) may have been saved from lapsing by Whitley's (1933) use of the name in the trinomial *Galaxias attenuatus scriba* Cuvier and Valenciennes, but the matter is of little consequence, as the length of the head and the form of the caudal fin recorded in the description of *scriba* differ substantially from those of the Australian and Tasmanian fish commonly regarded as *attenuatus*.'

3.2. Rejoinder.— *(a)* It is here suggested the characteristics, and therewith the validity of the proposed Tasmanian (and mainland Australian) subspecies could well be the subject of further investigation; *(b)* it is contended that, if this form is valid, its name should be *Galaxias attenuatus scriba* Cuvier & Valenciennes, 1846, not *Galaxias maculatus ignotus* Stokell, 1966.

3.21. It is not proposed here to examine critically the taxonomic status of the proposed three subspecies, a matter on which, without access to extensive series of fish from South America, New Zealand, mainland Australia and Tasmania, the writer is not prepared to express a considered opinion. However, in passing, several comments may be made. It is apparent that the basing of the South American form on three meristic characters of three individuals is a hazardous proceeding — with the assumption that the integral variates can be treated as a continuous series with a normal distribution, there is no statistically significant difference between the South American and New Zealand values for number of vertebrae ($t = 0.08$), or between the South American and New Zealand values for number of vertebrae ($t = 0.08$), or between the South American and Tasmanian values for number of branched rays ($t = 1.05$). For the Tasmanian form the ranges given for branched anal rays, branched dorsal rays are 13-16, 6-8; but both upper extremes cited are exceeded in our fish. No reference is made by Stokell to the three 'races' recognised by Regan, or to other characters considered by him (length of head, size of eye, location of ventral, shapes of dorsal, anal and caudal fins).

3.221. Though the prime issue here is the standing of Cuvier & Valenciennes' 1846 name for a possible Tasmanian subspecies, portion of the discussion in Stokell's paper immediately preceding his direct consideration of this name has been given above (3.11) to permit the calling of attention to several minor points. The date of *G. punctatus* is 1866 (the 1886 being a misprint, as is evident from the position of the entry in a chronological list). Macleay's species was described (1881:234) with trivial name *nebulosa;* which form is retained by both Regan (1906:368) and McCulloch (1929:48). The name *G. amaenus* Castelnau, 1872, spoken of as being kept alive by inclusion in Regan's and McCulloch's lists does not appear in Regan's paper (1906). This species has been synonymized with *G. attenuatus* by Mack (1936:99).

3.222. Of the names noticed as possible synonyms, the earliest, *G. scriba* Cuvier & Valenciennes is rejected (3.11) on length of head and form of caudal fin.

3.2221. The original description reads 'La longueur de la tête est comprise cinq fois dans la longueur totale'. [Macleay (1881), whose diagnoses of species on which he had no additional information to present usually follow those of Günther introduces an adventitious element of confusion by speaking of 'total length (without caudal)' in place of Günther's '(with the caudal)' (1866:212]. The statement that such a value differs 'substantially' from that found in *G. attenuatus* is not in accordance with fact, being based perhaps on inadequate acquaintance with the species. While a head 5.0 in total length (including caudal) is quite unusual, a value as low as 4.9 occurs in Tasmanian fish. Values of 'five', if interpreted as nearer five than six, are by no means uncommon: thus in Stokell's own Tasmanian sample of 15 specimens head in standard length is given (p. 74) as 4.70-5.73, mean 5.16, this minimum value being equivalent in many individuals to a head in total length ratio of nearer 5 than 6.

3.2222. The caudal fin is described as 'carée'; in Günther's account 'truncated'. This undoubtedly presents some difficulty. Perhaps all than can be said is *(a)* that the caudal, described by Regan in his species diagnosis of *G. attenuatus* as 'slightly emarginate', is, as pointed out by him 'usually not quite so distinctly emarginate' in the Australian 'race' as in the New Zealand 'race'; *(b)* considerable individual variation in the degree of emargination is encountered, some examples showing little sign of the lobes or shoulders usually developed; *(c)* in the fish from the Derwent River identified by Richardson (1848:76) as *G. scriba* the caudal is 'forked at the end'; *(d)* no known Australian *Galaxias* capable of being confused with *G. attenuatus* has a truly square caudal.

3.2223. One problem (not noted by Stokell) is the large eye, which is stated to be only two and a half times in the head. This value is not only numerically low for *G. attenuatus*, in which values below the '3 (young)-5' reported by Regan are very seldom met with, but it is also unusual for any species, being lower than that given by Regan for any of the more than a score of species he examined (of these, 4, including *G. attenuatus*, have values down to 3.0). However, Regan, who handled the holotype of *G. scriba*, states the eye is 'slightly more than ⅓ the length of head' — a value quite compatible with *G. attenuatus*. As Regan observes, 'The varying size of the eye in preserved specimens is sometimes due to the method of preservation: often the eye tends to protrude and the circular fold surrounding it is stretched or broken, thus apparently increasing the size of the eye.' That this may well be the case with the type of *G. scriba* is suggested *(a)* by the fact that Regan's sentence just quoted immediately follows, and is apparently an express comment on, his statement of eye-size in that specimen; *(b)* by Cuvier & Valenciennes' reference to the eye as 'plus saillons'.

3.2224. The long body — the height being given in the original account as ten times in the total length — would seem to point strongly to *G. attenuatus.*

3.2225. It is evident, therefore, that the interpretation of *G. scriba* as synonymous with *G. attenuatus* is, as noted by Stokell, not free of difficulty. Systematists with some experience of attempting assessment, in terms of modern taxonomic practice, of early generic and specific accounts would, indeed, commonly be agreeably surprised to find such a description without some perplexing point. However, having in mind *(a)* that Regan, with Cuvier & Valenciennes' type before him, synonymized their species with Jenyn's *G. attenatus*; *(b)* that *G. scriba* has been recorded from Tasmania by Richardson (1848:76), whose example from the Derwent River is almost certainly referable to *G. attenuatus*; *(c)* that, since Regan's revision, Australian authors in general have treated *G. scriba* as a synonym of *G. attenuatus; (d)* that Whitley (1933; and later) uses the trinomial *Austrocobitis attenuatus scriba* (see Stokell's comment quoted above in 3.11); and considering the general tenour of the above discussion, it would seem that, if an Australian (including Tasmanian) subspecies is recognised, the appropriate name for it is *Galaxias attenuatus scriba* Cuvier & Valenciennes, 1846, or (in accordance with an increasingly common practice of dropping Cuvier's name where the actual account is by Valenciennes alone — a procedure not adopted on Stokell's paper, and hence, for convenience of exnosition here not adverted to earlier) *Galaxias attenuatus scriba* Valenciennes, 1846, not *Galaxias maculatus ignotus* Stokell, 1966.

4. SUGGESTED IDENTITY OF *Galaxias auratus* AND *Galaxias weedoni*

4.0. The proposal. — Speaking of *Galaxias auratus* Johnston and *Galaxias weedoni* Johnston, 1883 — with which latter Regan and subsequent writers have synonymised *G. atkinsoni* Johnston, 1883; trivial name rendered *atkinsonii* by Regan (1906:378) — Stokell observes 'It seems questionable if these two nominal species are distinct' (p. 76).

4.1. The argument. — Referring to radiographs furnished by the British Museum, and reproduced as Plates I, II, of one specimen each of *G. auratus* and *G. weedoni*, both presented to that institution by Johnston himself, Stokell observes, 'The print of *G. auratus* shows 55 vertebrae definitely, but that of *G. weedoni* is less certain. At the posterior extremity several bones are disturbed and not clearly shown, but counting the neural spines in this short section and estimating the intervals the number appears to be 55 also. It seems questionable if these two nominal species are distinct.' No other evidence for or against conspecificity is mentioned. [On p. 76 it is stated that radiographs of three species, the present two and *G. affinis* Regan, 1906, are reproduced in Plate I; but in the setting up of the paper the three figures have come to constitute three separate plates, numbered I - III].

4.2. Rejoinder. — Johnston's two species are good species, are quite distinct, and there is no reasonable possibility of their being confused.

4.21. It will be observed that the argument for identity depends solely on the fact that in each of the two British Museum specimens the vertebrae are counted as 55.

4.211. Reliance on vertebral counts (at times in the complete or virtual absence of other criteria) is a feature of the paper. 'The most important of the specific characters used is the number of vertebrae. In addition to being a basic osteological character it has a particular value in differentiating species on account of the general lack of correlation between it and certain proportional measurements such as the length of the head in relation to the standard length' (p. 73). While vertebral complement is certainly a basic osteological character, it is by no means a specific constant, being in general equally variable with the more stable of the meristic and other quantitative characters commonly employed in diagnosis — thus, from Stokell's Table 5 the vertebral counts of four sets of material apparently representing as many species have ranges (in terms of filled cells of a unitary frequency distribution) of 5, 4, 4, 3, mean 3.75, while from Table 6 for virtually the same material (one additional specimen in one set, two additional specimens in another) the ranges of branched anal rays are 2, 3, 3, 2, mean 3.33. As with most other meristic characters the vertebral count can be employed definitively only in the form of a frequency distribution. Interspecific overlapping in vertebral counts is of the same order of magnitude as interspecific overlapping in anal and dorsal ray counts.

4.212. The assumption is here made that the occurrence in the two British Museum speciens of the same vertebral count indicates their probable conspecificity. By parity of reasoning all individuals among the four groups of Table 5 that happen to have 60 vertebrae (or, indeed, 61) belong to the same species. [In Tables 5, 6, 7 the question-mark following *G. attenuatus* and that following *G. truttaecus* indicate dubiety, not as to species determination as such, but as to the taxonomic propriety of the trivial name employed]. Again, an individual fish with 59 vertebrae can, by this procedure together with total neglect of indications afforded by other characters, be held to be a specimen of *Galaxias attenuatus, G. lynx, G. fasciatus, G. alepi-*

dotus, G. brevipinnis, G. postvectis and other species. The existence in two individual fish of the same vertebral count clearly could, in itself, indicate specific identity only in the situation that the form to be regarded as definitive has as this total a value (whether as a unique count or as a term in a distribution) that lies wholly outside the ranges of all other species (a condition likely to be fulfilled but seldom): for some data on overlapping values, see, *e.g.*, Stokell (1945, table II).

4.221. Reference, first, to Regan's key (p. 366), secondly, to his diagnoses (pp. 377, 379), thirdly, to his illustrations (pl. X, fig. I; pl. XIII, fig. I) surely offer good evidence of specific distinctness. Johnston's measurements and sketch of his type of *G. weedoni* have been made available by the redaction of his memoranda by Whitley (1929).

4.222. Some significant differences are evident on comparison of the radiographs published by Stokell of *G. auratus* (pl. I) and *G. weedoni* (pl. II). These include the existence in *G. auratus* of *(a)* larger head, *(b)* more posterior insertion of ventrals, *(c)* shorter ventral-anal interspace, *(d)* shorter caudal peduncle relative to length of anal base (note, however, length of anal base in *G. weedoni* is greater than is immediately apparent from the illustration, the fin including posteriorly a couple of rays of which only proximal fragments are preserved), *(e)* larger bases of vertical fins, *(f)* longer lower jaw.

4.2231. *G. weedoni* and *G. auratus* can be immediately separated on color pattern alone. Markings found in *G. weedoni* are of the same general type as those of a number of other forms — closely approaching, in examples predominantly barred and blotched, *G. parkeri* Scott, 1936, and in examples in which spots are more largely developed, *G. affinis* Regan, 1906: essentially similar patterns characterise a number of extralimital forms. [This pattern appears to be the norm in the genus *Saxilaga* Scott, 1936]. The pattern of largish clearly rounded spots and anterosuperior vertically set ellipses of *G. auratus* is quite unlike that of any other Tasmanian, and not closely paralleled by that of any extralimital, Galaxiid.

4.2232. Some of the characters useful in distinguishing between Johnston's two species are set out in Table I. Unbracketed entries in the second and third columns are general specifications. In the column headed *Galaxias weedoni* material in square brackets comprises three sets of data — first, a verbal specification or numerical value, obtained, where so indicated, by estimation from Johnston's figure (Whitley, 1929; pl. II, fig. 1), or calculated from Johnston's measurements, of his type (Whitley, 1929: 46); secondly, data yielded by a specimen, standard length 115 mm. total length 133, one of the examples handled by Regan, which the present writer examined some years ago by courtesy of the Australian Museum, Sydney; thirdly, data, comprising, in the case of metrical entries, ranges, mean, and (to present some evidence of the reasonably normal order of magnitude of the variability of the sample) coefficient of variation, yielded by 11 examples (standard lengths 75, 79, 84, 92, 95, 95, 96, 97, 104, 109, 115 mm, total lengths 91, 92, 98, 108, 111, 128, 108+, 111, 111, 121, 135 mm, respectively) from Crater Lake, Cradle Mountain (W. Connell). In the column headed *Galaxias auratus* material in square brackets is derived from a pooled sample of 2 individuals (standard lengths 65, 83 mm, total lengths 77, 93 mm) from Clyde River, ¼ mile below Lake Crescent at the road bridge (D. F. Hobbs) and 6 individuals (standard lengths 62, 68, 68, 71, 72, 78 mm, total lengths 73, 80, 82, 82, 84, 92, respectively) from Clyde River, Lake Crescent (B. C. Mollison). In both these columns material in round brackets is derived from Regan (1906). In the last item considered (Coloration) this usage of brackets is not observed; the account given being, for typographical economy, a conflation of known data.

4.23. Adult topotypical examples of *G. weedoni* are not available, but the writer has identified and measured several hundreds of juveniles from the Mersey River (type locality) and from other rivers belonging to the same general drainage system and flowing into the sea along the north-west coast of Tasmania. *G. auratus* was stated (Johnston, 1883: 141) to be 'confined to the neighbourhood of the Great Lake, at an altitude of about 4000 feet', while the example noted in his memoranda (Whitley, 1929:47) came from Lake Sorell. The source of the material used in the compilation of Table I, Lake Crescent, is just south of, and in direct communication with, Lake Sorell. The writer has not seen specimens taken in recent years from Great Lake itself, though large fish dating back to the last century and believed to come from this locality are known.

4.24. In juveniles of *G. weedoni* the pectorals are very large, exceeding in magnitude all other fins save the caudal. Specimens kept in captivity have been observed to possess particularly well developed powers of climbing, the pectorals being used for adhesion. When at rest the fish lies upon the bottom in an attitude similar to that of *G. parkeri*, curiously suggestive of a tetrapod in repose.

4.25. In a suggested sorting of Tasmanian species of *Galaxias* into three groups (1936:94) *G. weedoni* was associated with *G. johnstoni, G. parkeri, G. atkinsoni* if distinct, and, rather towards the fringe of the assemblage, *G. affinis; G. auratus* was placed with *G. truttaceus* and *G. scopus*, if distinct; the third category being represented only by *G. attenuatus*. Later information tends, if anything, to confirm the usefulness of this somewhat *ad hoc* classification.

NOTE ADDED IN PRESS

While this paper has been in press further data on components of New Zealand Whitebait (see section 2.2122, above) have been provided by McDowall (McDowall, R. M., 1966.-Further observations on Galaxias Whitebait and their relation to the distribution of the Galaxiidae. *Tuatara*, 14, 1: 12-18; New Zealand Fisheries Publication No. 74). If it indeed be the case that the contentions of the present paper are valid, it is unfortunate the delay in publication has permitted the appearance in the literature of a nomenclatural change against which objection is here advanced (*e.g.*, synonymization of *Galaxias attenuatus* with *G. maculatus* in McDowall, R. M., 1967.-New land-locked fish species of the genus *Galaxias* from North Auckland, New Zealand. *Breviora*, 265: 1-11).

TABLE I

COMPARISON OF *Galaxias weedoni* JOHNSTON, 1883 AND *Galaxias auratus* JOHNSTON, 1883

In the column headed *Galaxias weedoni* the first of the three entries in square brackets relates to the type, the second to a specimen from Regan's material, the third to a series of 11 specimens from Crater Lake, Cradle Mountain : in the column headed *Galaxias auratus* the entry in square brackets is based on a series of 8 specimens from Clyde River, Lake Crescent. In both columns entries in round brackets are derived from the accounts and figures of Regan (1906)

FEATURE	*Galaxias weedoni*	*Galaxias auratus*
Head in standard length	About 4⅓-5 [4.4. 4.8. 4.3-5.1, $\bar{x}$ 4.62 ± 0.02, *V* 1.4± 0.03] ('5')	About 3½-4 [3.5-4.0, $\bar{x}$ 3.72 ± 0.07, *V* 5.4 ± 1.3] ('About 4': measurements of Johnston's specimen, on which Regan's account is based, yield 3.9)
Relative length of jaws	Upper longer [From figure, upper longer. Upper longer. Upper longer] ('Lower jaw slightly shorter than upper')	Equal or lower longer [Lower longer] ('Jaws equal anteriorly')
Ventral inserted midway between caudal base and point specified	Anterior nostril-tip of snout [From figure, front half of snout; from measurements 0.7 of snout. Tip of snout. Tip of snout-anterior nostril] ('Tip of snout')	Preoperculum [Between posterior border of preoperculum (modal) and shortly behind eye] ('Posterior margin of praeoperculum')
Ventral-anal interval *(a)* In preventral length	About 1.8-2.2 [2.1. 1.8. 1.9-2.2, $\bar{x}$ 2.04 ± 0.03, *V* 5.2 *V*±1.1] (From figure, 2.1)	About 2.4-2.7 [2.4-2.7, $\bar{x}$ 2.54 ± 0.04, *V* 4.8 ± 1.2] (From figure, 3.1)
(b) Times anal base	>2 [From figure, about 2.6. 2.7. 2.4-2.8, $\bar{x}$ 2.56±0.06, *V* 7.1±1.5] (From figure, about 2.3)	< 2 [1.6-1.9, $\bar{x}$ 1.71 ± 0.04, *V* 9.8 ± 1.5] (From figure, about 1.7)
(c) Relative to head	> [1.1. 1.3. 1.1-1.3, $\bar{x}$ 1.19 ± 0.02, *V* 5.9 ± 1.3]	< [0.7-0.9, $\bar{x}$ 0.82 ± 0.02, *V* 5.5 ± 1.4] (From figure, 0.7)
Anal base relative to caudal peduncle (anal termination-hypural joint)	≥ [From figure, about 0.8. 0.8. 0.8-1.0, $\bar{x}$ 0.82 ± 0.02, *V* 8.0 ± 1.9] (From figure, about 0.8)	> [1.1-1.5, $\bar{x}$ 1.25 ± 0.04, *V* 9.4 ± 2.4] (From figure, about 1.1)
Combined dorsal and anal bases in combined trunk and tail, without caudal fin	> 3½ [From figure, about 4.5. 4.0. 3.7-4.3, $\bar{x}$ 4.1 ± 0.05, *V* 4.4 ± 0.9] (From figure, about 4.1)	< 3½ [3.1-3.4, $\bar{x}$ 3.29 ± 0.04, *V* 3.2 ± 0.8] (From figure, about 3.1)
Coloration *(a)* Body	Brownish or olivaceous, liberally marked with darker in variable combinations of more or less perfect bars, chevrons, blotches, spots, vermiculations — usually marks other than spots, sometimes spots predominating : spots not clearly and regularly rounded. A more or less clearly developed dark postpectoral bar	Reddish or yellowish, marked, particularly (often only) on the back and upper part of the flank with purplish spots: some of the anterior spots may be (usually are) more or less elliptical (major axis vertical), the remainder being clearly and regularly rounded. No dark postpectoral bar
(b) Fins	Dorsal, anal and caudal usually with some moderate-sized dark spots. No fins with dark margins	Dorsal, anal and caudal regularly unspotted. Dorsal, anal and ventral with black or blackish margins

REFERENCES

BLACKBURN, M., 1950.—The Tasmanian whitebait, *Lovcltia seali* (Johnston) and the whitebait fishery. *Aust. J. Mar. Freshw. Res.* 1 (2): 155-198; pls 1-6, text-figs 1-3.

BLOCH, M. E., & SCHNEIDER, J. G., 1801.—*Systema ichthyologicae.* Berlin.

CASTELNAU, F., 1872.—Contribution to the ichthyology of Australia. No. 1. The Melbourne fish market. *Proc. zool. aeclim. Soc. Vict.,* 1:29-242.

CUVIER, G. L. F. C. D., 1816 ['1817'].—*Le règne animal.* Paris.

....., 1822.—*Id.:* German translation (with additions), *Das Thierreich,* Schinz, H. R., 1821-1825. Berlin.

....., & VALENCIENNES, M. A., 1846. *Histoire naturelle des poissons,* xviii. Paris.

FORSTER, G., 1777.—*A voyage round the world.* London.

FORSTER, J. R., 1844.—*Descriptiones animalium.* Berlin.

FRANKENBERG, R., 1966.—Fishes of the family Galaxiidae. *Aust. nat. hist.,* 15 (5):161-164, 2 pls.

GMELIN, J. F., 1788.—*Systema naturae,* 13th ed.

GÜNTHER, A.—*Catalogue of the fishes in the collection of the British Museum,* VI. London.

HARRAP, (ed. MANSION, J. L.), 1953.—*Standard French and English Dictionary,* I. London.

JENYNS, L., 1842.—*The zoology of the voyage of H.M.S. Beagle during 1832-36. Part 4, Fish.*

JOHNSTON, R. M., 1883.—General and critical observations on the fishes of Tasmania; with a classified catalogue of all the known species. *Pap. proc. roy. Soc. Tas.* (1882):53-144.

....., 1929.—See WHITLEY, G. P., 1929.

LYNCH, D. D., 1965.—Changes in Tasmanian [whitebait] fishery. *Aust. fish. Newsletter,* 24 (4): 13 and 15. [For specification of periodical, see under MUNRO.]

McCULLOCH, A. R., 1929.—A check-list of the fishes recorded from Australia. *Mem. Aust. Mus.,* V, I-III (IV, Index, 1930).

McDOWALL, R. M., 1964.—A consideration of the question, "What are whitebait?" *Tuatara,* 12 (3): 134-146, figs 1-4.

MACLEAY, W., 1881.—Descriptive catalogue of the fishes of Australia. Part IV. *Proc. Linn. Soc. N.S.W.,* VI (II): 202-387.

MACK, G., 1936.—Victorian species of the genus *Galaxias* with descriptions of two new species. *Mem. nat. mus. Melb.,* 9: 98-100, figs 1-2.

MANSION, J. L., 1953.—See HARRAP, 1953.

MUNRO, I. S. R., 1957.—*Handbook of Australian fishes*—currently (1956+) appearing serially in *Australian fisheries Newsletter* (formerly *Fisheries Newsletter),* issued monthly by Commonwealth Dept Prim. Indust. Galaxiidae: 32-35 (16, 1, Jan. 1957-16, 2, Feb., 1957).

OGILBY, J. D., 1899.—Contribution to Australian ichthyology. *Proc. Linn. Soc. N.S.W.,* XXIV (1): 154-186.

PERON, F., & FREYCINET, L., 1807.—*Voyage de découvertes aux Terres Australes . . . le Casuarina.* ed. I, 1807-1816. Paris.

REGAN, C. T., 1906.—A revision of the fishes of the family Galaxiidae. *Proc. zool. Soc. Lond.* (1905), II: 363-384, pls X-XIII.

RICHARDSON, J., 1848.—Ichthyology of the voyage of H.M.S. *Erebus* and *Terror.* In: *The Zoology of the Erebus and Terror during the years 1839-1843.* Vol. 2.

SCHINZ, H. R., 1822.—See CUVIER, G. L. F. C. D., 1822.

SCOTT, E. O. G., 1936.—Observations on fishes of the family Galaxiidae. Part I. *Pap. proc. roy. Soc. Tasm.* (1935): 85-112, text-figs 1-4.

....., 1938.—Observations on fishes of the family Galaxiidae. Part II. *Pap. proc. roy. Soc. Tasm.* (1937): 111-143, pls XVIII-XXVII.

....., 1941.—Observations on fishes of the family Galaxiidae. Part III. *Pap. proc. roy. Soc. Tasm.* (1940): 55-69, pl. IX, text-fig. I.

....., 1966.—The genera of the Galaxiidae. *Aust. Zool.,* XIII (3): 244-258.

STOKELL, G., 1945.—The systematic arrangement of the New Zealand Galaxiidae. Part I. Generic and sub-generic classification. *Trans. roy. Soc. N.Z.,* 75 (2): 124-137, pls 8-12.

....., 1949.—The systematic arrangement of the New Zealand Galaxiidae. Part II. Specific classification. *Trans. roy. Soc. N.Z.* 77 (4): 472-496, pls 52-57, text-fig. I.

....., 1966.—A preliminary investigation of the systematics of some Tasmanian Galaxiidae. *Pap. proc. roy. Soc. Tasm.,* 100: 73-79, pls I-IV.

VALENCIENNES, M. A., 1846.—See CUVIER, G. L. F. C. D., & VALENCIENNES, M. A., 1846.

WOODS, C. S., 1963.—*Native and introduced freshwater fishes.* Wellington.

WHITLEY, G. P., 1929.—R. M. Johnston's memoranda relating to the fishes of Tasmania. *Pap. proc. roy. Soc. Tasm.* (1928): 44-68, pls II-IV.

....., 1933.—Studies in ichthyology. No. 7. *Rec. Aust. Mus.,* XIX, (1): 60-112, pls 11-15, figs 1-4.

....., 1935.—Whitebait. *Vict. Nat.* LII, 3 (619): 41-51, pl. III, text-figs 1-2.

....., 1944.—New sharks and fishes from Western Australia. *Aust. Zool.* 10 (3): 252-273, text-figs 1-6.